Listing of Claims

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Currently Amended) An apparatus comprising:

a plurality of features, the features including

a plurality of primary features having different phase step heights in a primary feature region, each primary feature abutting at least one other primary feature with a different phase step height, and

a plurality of sub resolution features in a boundary region surrounding the primary feature region,

wherein each of the primary features is dimensioned to resolve at an imaging plane at a resolution, and

wherein each of the sub resolution features is dimensioned not to resolve at the imaging plane at said resolution.

2. (Currently Amended) The apparatus of claim 1, wherein there is no opaque material between adjacent features in the primary feature region ~~or~~ and in the boundary region.

3. (Canceled)

4. (Currently Amended) The apparatus of claim 1, wherein ~~each of a plurality of pairs of abutting features in the primary feature region and the boundary region have different phase step~~

~~heights,~~ said ~~abutting features including~~ primary features ~~and~~ abut said sub resolution features.

5. (Original) The apparatus of claim 1, wherein the primary feature region comprises a chromeless alternating phase shift mask (APSM) structure.

6. (Original) The apparatus of claim 1, wherein the boundary region comprises an outer row including sub resolution features furthest from the primary feature region.

7. (Currently Amended) The apparatus of claim 6, wherein the sub resolution features have dimensional tolerances corresponding to a first lithography step precision, and

wherein the outer row has a dimension corresponding to a second lithography step precision.

8. (Original) The apparatus of claim 7, wherein said dimension of the outer row comprises a width of the sub resolution features of the outer row.

9. (Original) The apparatus of claim 7, wherein the dimensional tolerances corresponding to the first lithography step precision are smaller than dimensional tolerances corresponding to the second lithography step precision.

10. (Currently Amended) A method comprising:

~~defining~~ exposing a ~~plurality~~ pattern of features in a layer of photoresist material on a mask substrate, said pattern of features including

a plurality of exposed primary features in a primary feature region~~, each primary feature abutting at least one other primary feature~~,

a plurality of unexposed primary features in the primary feature region, wherein each exposed primary feature abuts at least one other unexposed primary feature,

a plurality of exposed sub resolution features in a boundary region surrounding the primary feature region, and

a plurality of unexposed sub resolution features in ~~a~~ the boundary region ~~surrounding the primary feature region~~; ~~and~~

developing the photoresist such that the mask substrate is ~~exposed~~ uncovered in accordance with the pattern ~~a first plurality~~ of ~~said~~ features ~~and the mask substrate is covered with photoresist material in a second plurality of said features~~;

etching the exposed mask substrate to define corresponding primary features and sub resolution features to have a phase step height in the mask substrate; and

removing the remaining photoresist material,

wherein ~~such that~~ no opaque material ~~remains~~ is found

between the primary features and the sub resolution features ~~in said plurality of features~~ on the mask substrate.

11. (Currently Amended) The method of claim 10, wherein said ~~defining~~ exposing comprises ~~defining~~ exposing the ~~plurality~~ pattern of features in the layer of photoresist material on the mask substrate using a first lithography tool.

12. (Original) The method of claim 11, wherein the first lithography tool comprises an electron beam lithography tool.

13. (Currently Amended) The method of claim 11, further comprising:

coating the mask substrate with another layer of photoresist material; and

~~etching~~ defining a boundary around the boundary region using a second photolithography tool, the second lithography tool having a lower precision ~~less~~ than ~~a precision of~~ the first lithography tool.

14. (Original) The method of claim 13, wherein the precision of the second lithography tool corresponds to a dimension of sub resolution features in an outer row of the boundary region.

15. (Original) The method of claim 13, wherein the second lithography tool comprises a laser writer lithography tool.

16. (Currently Amended) An alternating phase shift mask (APSM) comprising:

a chromeless APSM structure including a plurality of features, the features including

a plurality of zero and pi primary features in a primary feature region, wherein each zero primary feature ~~abutting~~ abuts at least one ~~other~~ pi primary feature, and

a plurality of sub resolution features in a boundary region surrounding the primary feature region,

wherein each of the primary features is dimensioned to resolve at an imaging plane at a resolution, and

wherein each of the sub resolution features is dimensioned not to resolve at the imaging plane at said resolution.

17. (Currently Amended) The mask of claim 16, wherein there is no chrome between adjacent features in the primary feature region ~~or~~ and in the boundary region.

18. (Canceled)

19. (Currently Amended) The mask of claim 16, wherein ~~each of a plurality of pairs of abutting features in the primary feature region and the boundary region have different phase step heights,~~ said ~~abutting features including~~ primary features ~~and~~ abut said sub resolution features.

20. (Original) The mask of claim 16, wherein the boundary region comprises an outer row including sub resolution features furthest from the primary feature region.

21. (Currently Amended) The mask of claim 20, wherein the sub resolution features have dimensional tolerances corresponding to a first lithography step precision, and

wherein the outer row has a dimension corresponding to a second lithography step precision.

22. (Original) The mask of claim 21, wherein said dimension of the outer row comprises a width of the sub resolution features of the outer row.

23. (Original) The mask of claim 21, wherein the dimensional tolerances corresponding to the first lithography step precision are smaller than dimensional tolerances corresponding to the second lithography step precision.

24. (New) The apparatus of claim 1, wherein the primary features comprise contact features.

25. (New) The method of claim 10, further comprising exposing a substrate using the mask substrate.

26. (New) The mask of claim 16, wherein the zero and pi primary features comprise contact features.

27. (New) An apparatus comprising:

an alternating phase shift mask (APSM) comprising a chromeless primary feature region and an assist feature region surrounding the primary feature region, wherein:

the primary feature region includes

a first primary feature dimensioned to resolve at an imaging plane and having a first phase step height, and

a second primary feature dimensioned to resolve at the imaging plane, the second primary feature sharing a common edge with the first primary feature and having a second phase step height such that electromagnetic radiation from the first primary feature destructively interferes with electromagnetic radiation from the second primary feature at the imaging plane; and

the assist feature region includes

a first assist feature dimensioned not to resolve at the imaging plane, the first assist feature having the first phase step height and sharing a common edge with the second primary feature, and

a second assist feature dimensioned not to resolve at the imaging plane, the second assist feature having the second phase step height and sharing a common edge with the first primary feature.

28. (New) The apparatus of claim 27, wherein:

the first primary feature comprises a pi primary feature;

the second primary feature comprises a zero primary feature;

the first assist feature comprises a pi assist feature; and

the second assist feature comprises a zero assist feature.